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# **Introductory Chapter: Overview of a Competent Sustainable Building**

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Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/intechopen.77176>

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## **1. Introduction**

Between the human being and the protective building space, always a relationship with a reciprocal character a permanent arrangement, where the human being interest is to create the necessary poise to his different well-unfolded activities, under that cover as space. The building is a major element of human life. It is a major concern, a major purchase, and has a major effect upon our lives [1]. We spend over 90% of our time indoors. Today, the technological archetypes of the modern buildings are formed of a mixture of many components such as materials, energy, and construction configuration systems, which influence directly on human life and health. In marketing vision, architectural product being creations of the human work, a time-consuming good, as any other manufacture, it has not only to be produced but also to get the user's disposal [2]. Although in sustainable design, the building becomes the system, subsystem should be examined. The climate has a solid impact on the conceptions of habitat forms and configuration of internal space [3]. While the holistic integration of systems is critical to sustainable building, every system within the system has its climatic advantage or disadvantage. The human being entered the third millennium without the hope of achieving permanent peace on our beautiful earth, sustainable development, and equality for all, where the earth is our sustainer, the chain of ecological survival. In the future, sustainable considerations will be a regular part of our basic beliefs and knowledge. Both of our norms and behavior as the physical environment must be automatically based on an environmentally balanced mind-set, not alone but along with many other considerations. Within planning, means that the green will be taken far to be more seriously that reuse of our cities will gain even more importance that green areas will be actively involved and that traffic patterns will be turned upside down. Reliability is the key to our human continuum and our prime resource for building. Earth sheltering, earth handling, and earth escaping are more clearly pronounced

in the vocabulary of architectural planning and design. Trees for shade and windbreak can bear a consideration in architecture and landscaping. But general landscaping is regarded apart from the architecture, whereas in intelligent bioclimatic design, it is most effectual as an integral part of the architecture and interresponsive with its inland farming and landscaping. The building experience managed to isolate the building from the unfavorable climatic conditions, determining an inside microclimate able to provide for physical comfort. At lower latitudes, the climate moderates and summer heat, as well as rain, becomes significant. Windows are designed to admit the winter sunshine while excluding it in the summer. Insulation is used to minimize heat loss, and ventilation helps to counteract heat gain. Sustainability is an overall vision of creating quality in all parts of the building by making a whole positive in building manipulation, where an appropriate balance must be ensured between the environmental, social, and economic considerations, but also with the context in which the building is part—the city and society. In other words, the overall construction industry faces a significant transformation. A change that really matters to the development community, that keeping in mind that ecology means the doctrine of keeping communities, so take care of things. Sustainability is not mysterious, but requires common sense, consideration, and action. It became clear to understand that sustainable building is a designation of the edifice that meets UN criteria for sustainability [4]. A sustainable city is organized so as to enable all its citizens to meet their own needs and to enhance their well-being without damaging the natural world or endangering the living conditions of other people, now or in the future [5]. The concept of “sustainable building” comes from the concept of “sustainable development.” It was coined in the Brundtland Commission’s report after the first green conference in the UN’s Director had taken place in Stockholm 1972. The main task, of sustainability in building design, is to a great extent reduce the energy consumption of other buildings and other environmental loads, which has also been the cause of the authorities since the oil crisis in 1973. Since the oil crisis, there are still tightening rules for building energy consumption through the building regulations; but new rules in building regulations only apply to the new construction, which is limited in number to the total building stock. Therefore, in the case of renovations and extensions to existing buildings, it is up to the homeowner to take into account the environment. Sustainability in building sector means that account should be taken of the construction on the environment, both in the long term and in the short term. In addition, through all phases of a construction process, from the production of building materials until it returns as waste. But also the environmental burden that settlement means in the form of property, where building sustainable is to build for the future. In this concept, it is necessary to meet our generation’s needs without destroying the ability of future generations to meet their own necessities. That is, a building is sustainable in both environmental, economic, and social terms. In other words, it means that a building is responsible for the environment as little as possible, that the building’s overall economy from construction to demolition is as good as possible and that construction is as good as possible for people to live. In pursuit of sustainable solutions, there are many examples of choices and solutions that can immediately be sustainable, but which cannot be considered sustainable in the full perspective. For example, a unilateral focus on energy savings without regard to the indoor climate can result in imbalances between environmental and social quality, thus resulting in a nonsustainable solution. Another example is an unqualified requirement to use locally produced materials to minimize transport without looking at the energy used for the production of the materials.

There has been a tendency for sustainability in construction to be perceived and introduced as single measures that can make the building sustainable. However, sustainable construction implies that planning and decision-making are based on an overall perspective, which cannot be ensured by individual measures. Low-energy buildings, environmentally friendly construction, green construction, and sustainable construction—are these all the same concepts? The answer is no—although they all aim to reduce energy consumption and to some extent limit environmental impact, sustainability differs significantly from the others [6]. The basic quality requirements for buildings will be expanded to include low resource consumption, recycling building materials, etc. In the sustainable building, planning and decision-making must be based on an overall perspective, which aims not only at low energy consumption, a good economy, or a good indoor climate. Instead, it should be said that the construction as a whole is sustainable and contributes to solving the environmental and societal challenges that we face. Environmental quality in the building comprises:

- Minimizing local, regional, and global environmental impacts as well as consumption of energy, resources, and water throughout the life cycle of the building.
- The building's resource utilization is optimized to minimize the formation of building materials and optimize recycling and recycling in all phases of the construction.
- Efficient land use and conservation or improvement of the area's biodiversity.

Sustainability is an overall vision of creating quality in all parts of the building and creating a whole, both in the building itself, where an appropriate balance must be ensured between environmental, social, and economic considerations, but also with the context in which the building is part of the city and society. In the face of sustainable solutions, there are many examples of choices and solutions that can immediately be sustainable, but which, in the clearest sense, cannot be regarded as sustainable. In another view, troglodyte architecturally sculpted out of the hillside landscapes of Morocco, the igloo of the Eskimos, Arabian courtyard houses, the Malaysian tree dwelling and even the Scandinavian thatched cottage. All these have features that aim at orientates, to shape buildings and to construct them from materials so that the protected space can sustain the hot or cold rigorous of the regional climate. The value of vernacular architectural spaces was not generally recognized until Violet le Due wrote his book [2]. Environmental quality for a building can be achieved by reducing the discharge of problematic problems associated with construction and optimizing resource utilization. There must be a focus on this in all building life cycle phases. Under the environmental quality, the focus is on designing a building that includes both low resource consumption and the choice of environmentally sound materials. Sustainable buildings avoid as far as possible the use of problematic environments that can harm both the environment and health [7]. The land area used for construction is also considered an important resource that should be used with care and as efficiently as possible. Here, the focus should be on whether the environment's environment can be improved, biodiversity maintained or increased and how the water development is best organized. The environmental aspect of sustainability has traditionally been added to the highest value. In addition, in many cases, both builders and advisers have been equated with low-energy buildings and environmentally friendly construction. The vision of the sustainable building is a form of space that is adapted to the

place. It is powered by local renewable resources, uses renewable resources for heating and lighting, produces only waste that can be recycled on site, has a good indoor climate, can be demolished and recycled or transformed into nature, creating a good lifestyle and giving goodwill to its residents. Energy consumption in the drive contributes to a beneficial part of the environmental impact of a building and it is, therefore, relevant to focus on this, but environmental sustainability is broader than that and focuses on environmental impacts, use of problematic resources, and the use of resources as a whole [8]. For example, a unilateral focus on making a building self-sufficient with energy could result in both the economic investment and the resource consumption and environmental impacts, overall, exceeding the benefits of energy savings and thus the overall result cannot be termed sustainable. This may be the case, for example, if a building is insulated with such insulation that the energy consumption for the production of the last amount of insulation does not earn a living through savings on the building's heat consumption.

## 2. Sustainability in the building field

### 2.1. The values of sustainable building elements

Sustainable building elements are those which express to value one type climate-cultural, and corresponding to specific functions. The forms of those building elements are much diversified, the ones being consecrated as symbols established, a long time ago, in many hundreds or [2, 11]. The vernacular architecture plays this role, as a source of valorous semiotics expresses. The architectural profession feels politically responsible and offers its co-operation in developing a sustainable policy for architecture to make the architecture of today, the cultural heritage of tomorrow. The direct environmental impact of building environment upon construction, maintenance, and operation as well as demolition/disposal is several and diverse. Buildings' fixed installations with ventilation systems, appliances, pumps, TVs, lighting, computers, and a number of smaller appliances often use unnecessarily much electricity. The indoor climate is affected by many factors, including the use of problematic chemicals. These come from building materials and appliances and furniture, etc., and have a harmful as well as a detrimental effect on the external environment discharge of phthalates in the aquatic environment. The construction of a building and/or living in a building will always cause a strain on the surroundings. It is difficult to remove such strain: The ecological house is not found. But a house can always be made more organic and less environmentally harmful. The sustainable building is nothing absolute. It is, therefore, more correct to use the words more "or less extraordinary and good" or optional sustainability. Throughout the building's value chain, it is necessary to work out from ambitious and long-term visions. Only in this way can we accelerate development and achieve the requirements. Employed on sustainability can be summarized in two basic paradigms that can give an overall understanding of the concept and are used as a common vision and set aside for specific projects. Sustainability in construction must be ensured by:

- Think in a long-term

Take advantage of a life cycle perspective and I will take it all building lifecycle—not just look at construction and use here and now.



- Think in a wide form

It takes in evidence using a holistic perspective and observes the building as a whole and as part of the larger context, it encompasses local, regional, and global consequences, not just the constructional. This means that the arrangement and planning of buildings and renovations must be considered broad and long term with a balance between the qualities. Carrying strain, where the rate must be in line with the entire value chain of the building, and sustainable solutions will benefit all players in shorter or longer terms. The following sections elaborate on the whole and life cycle, in addition, perspective, as well as the environmental, social, and economic quality of construction is being developed. Overall perspective—think wide. For example, a unilateral focus on energy savings without regard to the indoor climate can result in imbalances between environmental and social quality, thus resulting in a nonsustainable solution. Another example is the use of locally produced materials to minimize transport without looking at the energy used for the production of the materials. Sustainable building, building materials life cycle, after which participants have such knowledge of the societal interests and principles of sustainable construction that they can select materials and building processes in order to carry out energy-efficient and sustainable construction. Sustainability is often perceived as a loose and nonbinding term. The fact is, however, that sustainable building is well described in international standards.

## **2.2. The concepts and aspects of sustainable building**

The sustainable building concept is to protect and minimize withdrawals from resources and ecosystems, long-term resource efficiency, low operating costs, healthier indoor environment, and the preservation of social and cultural values. The concept is very ambitious and is based on a holistic approach throughout the life cycle of the building, from raw material recovery over the use phase, to demolition, disposal, and recycling. On a building level, the assessment of sustainability is based on three aspects: environmental aspects, social aspects, and economic aspects. The sustainable building consists of environmental, social, and economic dimensions. In the sustainable building, these three dimensions are seen as basic qualities, which must be balanced against a life cycle perspective and for the construction as a whole. The three qualities, which together characterize a sustainable construction, cover a number of different factors that must be included in the planning of sustainable construction. However, it is planned and decided on an overall perspective, which cannot be ensured by a single action. In the sustainable building, planning and decision-making must be based on an overall perspective, which aims not only at low energy consumption, a good economy, or a good indoor climate, for example. Instead, it should be noted that construction as a whole is sustainable and contributes to solving the environmental and social challenges. Sustainable building is defined on the basis of three aspects: environment, human, and economic. In the sustainable construction, there must be a mutual balance.

### *2.2.1. Environmental aspect*

The sun is the ultimate power source and it is made up of layers of hot gases. The sun's beneficence is most pervasive and obvious as a provider of warmth and light. Sun is the

unique source of climate factors, which determines the architecture and building design. The evaluation of a number of climatic factors measured in the open field, such as solar radiation, temperature, and wind, forms a necessary, but insufficient part of this task. In the case of building information about the effect of a given temperature, the available solar radiation and wind are at least as important. Another problem is the difference in a climate that is difficult to quantify between weather stations and building location. A professional evaluation of the sustainable building meaning concludes that it represents a system which is based on human thermal comfort consideration. Accordingly, it is sufficient to distinguish four main climate types (cold, temperate, warm dry, and warm humid). To describe the climate in relation to energy use, it is necessary to work from quantifiable characteristics, which most clearly relates to the heating or cooling requirements of a building. A regulate analysis of the connotation of the word “environment” in the sustainability domain explains clear circumstances of a being or thing (social, economic, and physical) [9]. A human being may be aware or unaware of environmental influences. The environment makes an objective relation between the occupants of the building and the environment. Vernacular architecture is highly responsive to its immediate environment because the owners and buildings understood their environment better than we do ours today. This is due to several differences in lifestyle. Today, we move building more frequently and few of us work out of doors. Thus, we do not understand from experience how much windier it can be in one part of a field than in another. Today, we must do more investigation of local microclimate using instruments to help us make such decisions. The building local microclimates play an important role in determining the energy requirements of a building. Both the summer ventilation and cooling loads and the winter heating load can be reduced by well-considered local microclimate use. Close observation is required to highlight the preferred areas on a site. Existing vegetation, geology, and topography all play a part in creating a unique microclimate for every site. There are analytical tools available for simulating the wind flow patterns around buildings, trees, and landforms and for an onsite investigation of microclimate. Energy saving is an essential factor to reduce the emission of carbon dioxide, which is a cause of global warming, and ventilation is only a unique method to control the indoor air quality and also regarded as an effective method to sweep out the indoor [10]. In contemporary terminology, traditional, architecture, in the climatic zones with excessive temperatures in particular – may be called “architecture aware” of energy, “environment adapted” or “architecture bioclimatic,” where conventional energy abounds, architecture is seeking its usual balance ever, mainly determined by the environmental condition. Environmental quality has an impact on nature, environment, climate, and the planet’s resources. In a natural lighting study, for example, the diminishing of energy uses in buildings and progression of consumer physical comfort by means of practical daylighting strategies takes on more and more meaning and relevance [11]. Considering the environment, you minimize energy consumption, all resources and water consumption in the building’s life cycle. One optimizes the utilization of the building, in order to minimize the construction waste and focus on recycling in all phases of the construction. At the same time, you minimize or completely avoid using harmful substances in the building. It is necessary to understand that the conservation of energy through better building shelter is logical, but is not a priority for either current or future building owners. This is primarily the result of economic consideration. For energy conservation to be elevated to the top of the national policy agenda, it needs

to be demonstrated that it can lead to significant cost savings within a relatively short payback period without a reduction in the quality of the internal environment. Heat management of different building components is the most effective assess for energy efficiency [12]. The building as an expensive and long-term investment requires best environmental and energy efficiency practices. Architects and engineers from different backgrounds have shown that environmental action, economics, and building design are no contradiction. Thermal zoning is a vital consideration in recently designed environmental building. A thermal zone represents an enclosed space in which the air is free to flow around and whose thermal conditions are relatively consistent. In most cases, any interior space can be closed off with a door would be a separate zone [13]. The approach to the sustainable building will not only evaluate alternative construction materials, product life span, and energy efficiency, but also encourage the improvement of local microclimate quality, by design with regard to bioclimatic architectural principles.

### *2.2.2. Economic aspect*

Economic quality means that there is a balance between total costs and the quality of the building. This aspect means, among other things, that there is a balance between the building's overall economy and the overall quality of the building, and that the buildings are effectively utilized. The price of any product "architectural or building material" does not have to reflect the product's quality. It is important for designers and architects to understand how a product's purchase price relates to its life cycle cost. It will be crucial for the activity of the opportunity to lower their administrative costs. A sustainable building requires that the developer gives priority to long-term solutions. The short-term interest is not compatible with sustainable building. The short-term thinking leads to building contractors and project designers are not interested in low operating and maintenance costs, except when it can be a positive factor for the boost in the sale of the property. Economic encouragements and motivation are necessary to achieve the long-term benefits of building sustainable, where short-term economic interests are often at odds with building sustainable. Short-sightedness creates problems and all parties eventually deplete economies. The daily debate is about the prices of building materials, has to be lower in order for it to be cheaper to produce, for example, housing. The reason for choosing the less resistant materials for new construction, renovation, or upgrading is that it is too expensive to choose higher quality options [14]. The development of "cheaper" building materials has in some cases pushed up construction materials and working methods that subsequently proved to have adverse effects for both health and environment. Economic sustainability focuses on optimizing the operation of a building and, in addition to focusing on operating costs, includes the possibility of higher rental rates, better rental opportunities, increased productivity of the building user, value stability, and better financing options. The economic method to achieve sustainability is to focus on the low life cycle costs for building materials and methods. With an example from practice, we want to show on a construction project that reached the low investment cost, despite the choice of quality materials, choices made on the basis of focusing on low life cycle costs. An effective tool to achieve a sustainable building is to let life control on investments. It has been shown that a favorable life cycle economy often goes hand in hand with a favorable



life cycle assessment. A life cycle cost is the sum of the annual operating and maintenance costs and because the investment translated to today's costs. Calculation of life cycle cost is a method used to optimize an investment and to be able to assess the investment that provides the lowest total cost. The investment cost is normally 10–15% of a building's total life cycle cost, over a life span of 50 years. Thus, the choice of materials in the investment stage affects 85–90% of a building's total life cycle cost positively [15]. The better solution, the longer the life span and the cheaper it becomes in the long run. So it is in the early stages of the construction project as the building's continued cost development is determined. Products that last longer are often more expensive to buy, but they cost less to maintain compared to a product that is cheaper to buy. Environmental investments, for example, in the form of alternative technologies, may often take a back seat in favor of cheaper and more energy-intensive solutions. In a life cycle perspective, however, the investment cost of a building is small in relation to operational costs. By already selecting the system that has the lowest life cycle cost rather than the lowest investment cost comes more health and eco-efficient solutions to turn out profitable. Many experts believe that external economic incentives can act as motivators for project development institutions. The financial incentives and motivations we found and that we think are highly relevant in order to affect the construction industry in a sustainable and desirable direction are as follows:

- Life cycle costs that give economic optimization of the investment;
- A successful construction process in order to achieve better economy;
- Economic incentives, environmental classification of buildings and housing;
- Environmental solutions to win the competition and market share.

In order to create a stable economic activity, it is important to find win-win solutions where the environment, companies, and customers will be the winner. The daily debate boils down to the price of building materials, which has to be lower in order for it to be cheaper to produce, for example, housing. But the development of the “cheaper” building materials has in some cases pushed up construction materials and working methods that subsequently proved to have adverse effects on both health and environment. In order to achieve long-lasting buildings, it is important to take account of the product's life cycle costs for promoting long-term solutions. A sustainable building requires that the developer gives priority to long-term solutions.

In practice, the focus here is, for example, on using materials and constructions that facilitate cleaning or longer life before replacing. In addition, energy consumption also contributes to economic sustainability. Economic sustainability works with the concept of total economy, which looks at the overall economy for a lifetime of a construction rather than just looking at construction costs. In an attempt to reduce climate impact, there has been a great deal of focus on reducing the energy consumption of buildings (heat loss), but the climate change of material consumption alone has proved to be of significance of both new and renovated buildings, the closer they come to the new energy classes. In order to reduce the overall environmental impact of buildings, it is important that the materials be produced with low environmental

costs, as it may be as important as heat loss. A good material choice has an immediate positive effect on the environment, while a reduced heat loss has an effect that differs throughout the life of the material. In addition to the actual CO<sub>2</sub> consumption, environmentally sound materials can typically be recycled, or composted to avoid landfill (accumulation) and save the environment for other types of pollutants [16]. Therefore, the purpose of this material is to describe some of the materials that stand out as sustainable. The text should preferably be read in conjunction with the section on sustainability to achieve a broader understanding of the meaning.

### 2.2.3. *Social aspect*

The shaping of a socially acceptable and individually satisfying environment demands participation with the people as well as with the environment. There are many examples around the world that reveal how people under given environmental, social, and technical limits have striven to create the most suitable living conditions in accordance with nature. Good purposeful design of anything has intended meaning which blends form, function, and human values. There is a coherent unity or wholeness, which is difficult to define except by a phrase like it feels just right. The designer and examples abound in architecture, science, engineering, and the arts have interpreted a series of needs and blended these into a whole. Environmental adequacy has three essential attributes, flexibility in environmental control, identification of need and economy of material, and manpower resources [2]. The alternative wants a dynamic and engaging society that creates social and health equity and justice. It is necessary to develop the best opportunities for creating an individual life as part of the community, and everyone should be able to contribute to the community. The direction of a generally sustainable society goes not only through an increased focus on material equality and social security, but also through human equality as well as the experience of contributing to society and being appreciated as an individual [17]. However, they also have many social challenges. It is as though they have stalled or even gone back in some basic areas. The alternative will, therefore, challenge the social policy agenda through brave experiments. We must focus on well-being and we must dare to invest in people. The alternative has three visions for social sustainability:

- Balance in everyday life;
- Investing in people;
- Everyone must be able to contribute to society.

Today, there are many people who, for various reasons, are marginalized in relation to human society. As an individual, it can be hard to see what to do for the conversion to ecological sustainability, but we become stronger through communities, and the conversion will necessarily be done locally. It is therefore important to recreate local communities and groups that can act together and boost the conversion. Neighborhoods, ecosystems, and associations are already well underway. There are examples of groups in the informal economy (civil society) that are important actors and should be supported and expanded with more local initiatives that can

bring about change from below. In modern life, in many areas, humans have already built up a strong welfare society and a good starting point for the development of a socially sustainable society. The dimensions of social and cultural sustainability are therefore just as important. Traditional societies often had a holistic view of their place in the cosmos and their interventions in nature, and their architecture was well adapted to the local environment. However, their technology was often far from sustainable, in part, due to a lack of global awareness and scientific knowledge, which we have today. Their sociopolitical systems—tribal, feudal, dictatorships, and so on—were not always something to get very romantic about either. The modernist world replaced the goods of old with rationality and science. Modernism sought a new, universal vision, but in doing so discarded both tradition-based wisdom and design based on local context. In addition, the specialization of knowledge and functions led to disorientation and fragmentation of the world, both physically and spiritually. The intelligent bioclimatic vision combines global view and a local context and integrates the dimension of time into architecture so that the global and the local, both the past and the future become our informants in the act of architectural creation. Buildings are complex obstructions not only because they have irregular openings, but also because they are psychological as well as physical barriers. To convert our society to a sustainable society is not only a job for the experts but is based on everyone's dedication and daily involvement. To act in a new way.

### 3. Building materials and sustainability

The choice and use of building materials have an environmental impact. Production, transport, and use of building materials mean consumption of energy and raw materials as well as pollution of the environment. This section deals with a range of building materials, which, with today's knowledge, can be considered as being in favor of more environmentally friendly. Another object which signifies the main concern for architects and designers is the overall environmental impact of building materials that can only be determined when the material is viewed in correlation with the building in which they are used. Why consider new material choices and habits? The building materials "share of buildings" overall climate impact in a life cycle perspective shows that:

- The share of the building materials' segment on the climate impact is great and it is absolutely necessary to work with efforts to reduce greenhouse gas emissions.
- The share of the building materials' segment of the climate impact is increasing in relation to the decreasing energy consumption in the newer houses' operational phase. However, it does not mean that it cannot be deducted to reduce energy consumption in operation as the challenge in the low-emission society is to distribute energy resources differently than today, where buildings capture about 40% of total energy consumption.

#### 3.1. Building materials selection

To build a sustainable building in general, and resistance in particular, requires having knowledge of building materials and construction chemicals, as there are many factors to take into

account. The impact of building materials on the environment embodies the essential method implicitly significant in this research to effectively determine traditional building materials in the environment, in addition to comparative analysis [18]. In order to determine the optimal use of materials, it is necessary to look at the environmental impact of materials from beginning to end, making life cycle analyses of the materials in question. The requirements of selecting building materials can be described as environmentally friendly or ecological is a difficult matter. The selection can be done on comprehensive life cycle assessments that can show the overall environmental impact of a product but may also be commonplace. The pasta is that most materials selected according to reason and feelings will show compliance with life cycle analyses. For better selection of materials, the following are necessary to be taken into account:

1. Product life;
2. The environmental characteristics of the product (pollutants) and origin;
3. The ease of use of the product;
4. Possibilities for separating, repairing, replacing, and recycling the product after use;
5. Energy consumption in manufacturing, distribution, and use during the construction phase;
6. Indoor climate conditions.

By reviewing basic building materials for foundations, exterior walls, roof constructions, etc., it should be mentioned that not all of the building materials listed below are equally easy to find in the local construction market, but by virtue of this, in supplier registers, most building materials can be obtained and procured, some building materials from building to be demolished can be recycled, just requiring a lot of time and courage to acquire the right materials. You should also have the possibility of storage space for the materials until they are used. There are demolition companies that have large stocks; it should be possible to find good building materials. Recycling of building materials is in most cases sensible, including in many cases also the recycling of materials that would be unprofitable if they were new [19]. Some points to consider when choosing building materials can then be as follows:

1. Renewable materials are usually recommended.
2. Energy consumption for production of the material should be as reduced as possible. This is a very complex area and, therefore, very important.
3. Different sources have different quality and it is, therefore, important to take into account the energy quality used in the manufacture of materials.
4. Transport of materials requires high-energy consumption. What are the physical interventions in nature that must be done for building material production? How many emissions being released? Are synthetic and stable naturally occurring materials produced in the process? Unnatural and stable substances such as polychlorinated biphenyls and

brominated flame-retardants will not break down in nature and causes instead damage to humans, animals, and nature.

5. Health effects on humans. It is necessary to analyze the impact of building materials on the people's (physical, psychological, chemically and biologically), where it affects instantly on human life. Can the materials be repaired and what maintenance frequency do they have?
6. Can the materials be reused or otherwise recycled?

The selection of building materials and methods also affects greatly the ability to reuse building materials during the recycling process. It is important to stop the loop in order to achieve a whole when a broken cycle inevitably leads to imbalances in nature. Everything taken from the earth must be reversed to a cycle to be late. When there is talk about healthy and eco-friendly building, it is often unclear as to exactly what it is that makes a building to be referred to as healthy and environmentally friendly. The reason is that there are many different areas that must be taken into account as a whole and so far there are a few who look at it from a holistic perspective. Life cycle analysis is a method to determine the environmental impact of a product or service from cradle to grave. Life cycle analyses are resource and time consuming to produce and should be made by those who produce or import products. A life cycle analysis can many times give increased knowledge about the product and pave the way for new developments when the analysis provides a wealth of knowledge about production. The selection procedure is intimately linked with the choice of design and building method. The building control of both quantity and type of material, and it is the finished construction in its entirety that is decisive for the indoor climate and building sustainability. It is already in the planning and design stage as the future sustainability of buildings is determined. When comparing materials, the fairest comparison ways will be to take into account the entire life span of the materials. Concrete, for example, is a durable material with long life and low maintenance requirements. In addition, a building in concrete is more energy efficient than a building in wood or steel because of its tight construction and good heat storage capacity. This may result in lower energy consumption in the use phase, which in some cases is considered as the most significant phase of a building's life cycle [20].

### 3.2. Recycling model of building materials

Recycling of sustainable building materials is the area that first received attention in the field of the environment in the construction industry. Recycling and reusable building material can be done in four steps. The first step is that the buildings be designed and maintained in such a way that they can be used flexibly for a long time. The second step is to be designed so that they can be "picked apart" and the parts used again. Some important strategies for tackling the rock of construction waste are:

- Minimize the amount of waste by having a careful planning and design, use as few materials as possible;



- Use reusable materials and construction methods that allow for the dismantling of building components;
- Recycle building and demolition waste for maximum recovery.

In the new building, it can choose to reuse the old materials such as bricks and, usually, some of these phases involve physical changes to the property and its equipment, while others are more about what we can achieve by changing our thought patterns and habits.

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